

Customer No.: 31561
Application No.: 10/604,509
Docket No.: 10380-US-PA

REMARKS

Present Status of the Application

It is noted with great appreciation that the Examiner deems claims 13-14 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claim.

Claims 1-27 are pending of which claims 1, 9-10 and 13 have been amended, claim(s) 8 (and 15-23) has been canceled without prejudice and disclaimer, and claims 24-27 have been newly added, to more explicitly describe the claimed invention. Furthermore, the specification has been amended to correct some minor typographical errors. It is believed that no new matter adds by way of amendments to claims, specification or otherwise to the application. For at least the following reasons, Applicants respectfully submit that claims 1-14 and 24-27 patently define over prior art of record and reconsideration of this application is respectfully requested.

Discussion of the claim rejection under 35 USC 103

1. The Office Action rejected claims 1-5, 8 and 11-12 under 35 USC 103(a) as being unpatentable over Tseng et al. (US-5,677,228, hereinafter Tseng) and further in view of Num et al. (US-6,765,252, hereinafter Num).

In rejecting the above claims, the Examiner stated that Tseng discloses all the features of the claimed invention except for the steps of forming a cap layer inside the second opening; removing the mask layer; and forming a source/drain region in the

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substrate. However, the Examiner relied upon Nam to disclose these steps, wherein Nam shows a step of forming a cap layer (45, FIG. 8) inside the second opening, removing the mask layer (46, FIG. 8) and forming a source/drain region (41, FIG. 9) in the substrate. It would have been obvious to one skilled in the art at the time of the

invention to apply the teaching of Nam to Tseng discussed above such that a step of forming a cap layer inside the second opening, removing the mask layer and forming a source/drain region in the substrate for a purpose of improving a manufacturing of a semiconductor device.

Applicants respectfully disagree and traverse the above rejections of the Examiner as follows. Applicants respectfully submit that the independent claim 1, as amended, is allowable for at least the reason that both Tseng and Nam fail to teach, suggest or disclose every features of the amended proposed independent claim 1. More specifically, both Tseng and Nam fail to teach, suggest or disclose a method of fabricating a semiconductor device comprising at least "forming a gate dielectric layer and a polycide layer inside the first opening sequentially, wherein the polycide layer fills the first opening" as required by the amended proposed independent claim 1. The advantage of the above process step is that because the polycide layer is formed inside the opening, therefore the sidewalls of the polycide layer is not directly exposed to the subsequent thermal oxidation process. Thus, lateral growth of the polycide layer can be effectively reduced.

Applicants respectfully submit that the presents inventors recognized that when the polycide layer comprising, for example, a polysilicon layer and the tungsten silicide

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layer, is NOT formed inside an opening, the sidewalls of the polycide layer are directly exposed to the thermal oxidation process; consequently, the tungsten silicide layer may react with the oxygen to form tungsten oxide and therefore lateral extrusions (as shown in Figure 1D) are often formed on the sidewalls of the tungsten

silicide layer and may undesirable electrically connect with neighboring conductive

structures causing short circuits and thereby adversely affect the performance of the semiconductor device. In order to remedy the above problems, the present invention proposed forming the polycide layer inside the opening of the substrate so that the sidewalls of the polycide layer is not directly exposed to the thermal oxidation and also the sidewalls of the polycide layer is supported by the sidewalls of the opening. Thus, the lateral extrusions from the sidewalls of the polycide layer can be effectively reduced.

Instead, Tseng, Fig. 5, lines 5-15 of col. 3, substantially teaches a process of forming a resistor comprising the steps of forming an undoped polysilicon layer (44) over the oxide layer (42) and a heavily-doped polysilicon layer (46) over the undoped polysilicon layer (44) inside the trench (40). Therefore, it is clear that Tseng substantially fails to teach, suggest or hint forming a polycide layer inside the opening as required by the proposed amended claim 1, instead Tseng substantially teaches forming a polysilicon resistor (44, 46) inside the trench (40).

Furthermore, because Tseng substantially teaches a process of forming a polysilicon resistor (44, 46) inside the trench, therefore, Tseng cannot possibly recognize the problems associated with polycide gate structure during the thermal oxidation much less teachings on remedy of the problems due to formation of lateral

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extrusions from the sidewalls of the polycide layer, which the present inventors propose to resolve. Therefore, it is clear that Tseng cannot possibly suggest one skilled in the art to form a polycide layer inside the opening of the substrate for remedying the problems caused by the exposure of the sidewalls of the polycide layer to the thermal oxidation process as proposed by the present inventors.

Furthermore, because Nam also fails to teach, suggest or disclose a process of forming a polycide layer within the opening/trench, and therefore, Nam cannot possibly cure the specific deficiencies of Tseng for at least the reasons substantially discussed above. Accordingly, Applicants respectfully submit that both Tseng and Nam, neither alone nor in combination, render every features of the amended proposed Claim 1 obvious in this regard.

Because, the newly added proposed independent claim 24 also recite features similar to those recited by the amended proposed claim 1, therefore, Applicants similarly submit that the new proposed independent claim 24 also patently define over Tseng and Nam for at least the same reasons discussed above.

Furthermore, the new independent claim 24 further recites "forming the polycide layer over the doped polysilicon layer inside the opening, wherein the sidewalls of the polycide layer is enclosed by the doped polysilicon layer". The advantage of the above feature is that at least the thermal oxidation of the polycide layer can be effectively reduced by the doped polysilicon layer. Applicants respectfully submit that both Tseng and Nam substantially fail teach, suggest or hint at least a step of forming the polycide layer over the doped polysilicon layer inside the opening, wherein the sidewalls of the

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polycide layer is enclosed by the doped polysilicon layer, instead. Tseng substantially teaches forming a polysilicon resistor (44, 46) over the oxide layer (42), wherein the sidewalls of the polysilicon resistor (44, 46) is enclosed by the oxide layer (42), and Nam fails to even mention forming a polycide layer inside an opening. Thus,

Applicants respectfully submit that both Tseng and Nam substantially fail to teach, suggest or hint the above feature of the new claim 24 as well.

Claims 2-6, 11-12 and 24-27, which directly or indirectly depend from claims 1 and 24 respectively, are also patentable over Tseng and Nam at least because of their dependency from an allowable base claim.

For at least the above reasons, it is therefore submitted that claims 1-6, 11-12 and 24-27 patentably define over Tseng and Nam and therefore claims 1-6, 11-12 and 24-27 should be allowed. Reconsideration and withdrawal of these rejections is respectfully requested.

2. The Office Action rejected claim 7 under 35 USC 103(a) as being unpatentable over Tseng and Nam in view of Liu et al. (US-6,509,249, hereinafter Liu).

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Applicants respectfully disagree and would like to point out that even though the Examiner relied upon Liu to disclose the mask layer and the anti-reflection layer, still Liu cannot cure the specific deficiencies of Tseng and Nam for at least the same reasons discussed above. Therefore, claim 7 also patently define over Tseng, Nam and Liu for at least the same reasons discussed above. Reconsideration and withdrawal of the above

rejections is respectfully requested.

3. *The Office Action rejected claims 9-10 under 35 USC 103(a) as being unpatentable over Tseng and Nam in view of Liu et al. (US-6,046,108, hereinafter Liu'108).*

Applicants respectfully disagree and would like to point out that even though the Examiner relied upon Liu'108 to disclose the materials of refractory metal silicide layer, still Liu'108 cannot cure the specific deficiencies of Tseng and Nam for at least the same reasons discussed above. Therefore, claims 9-10 also patently define over Tseng, Nam and Liu'108 for at least the same reasons discussed above. Reconsideration and withdrawal of the above rejections is respectfully requested.

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CONCLUSION

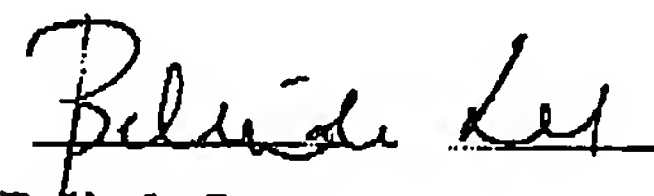
For at least the foregoing reasons, it is believed that all the pending claims, 1-14 and 24-27 of the present application, patently define over the prior art and are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above identified patent application, the Examiner is invited to call the undersigned.

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Respectfully submitted

Date :

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Belinda Lee

Registration No.: 46,863

Jianq Chyun Intellectual Property Office
7th Floor-1, No. 100
Roosevelt Road, Section 2
Taipei, 100
Taiwan
Tel: 011-886-2-2369-2800
Fax: 011-886-2-2369-7233
Email: belinda@jcipgroup.com.tw; usa@jcipgroup.com.tw

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